DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1507-B

Base from U.S. Geological Survey
Crater Lake National Park and vicinity, 1888–1956; Pelican Butte, 1954; Lake of the Woods, Mount McLoughlin, Rustler Peak, 1955; Prospect, 1956.

Road net, section lines, and National Forest boundaries modified by U.S. Forest Service, 1973.

SCALE 1:62500

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

APPROXIMATE MEAN DECLINATION, 1983

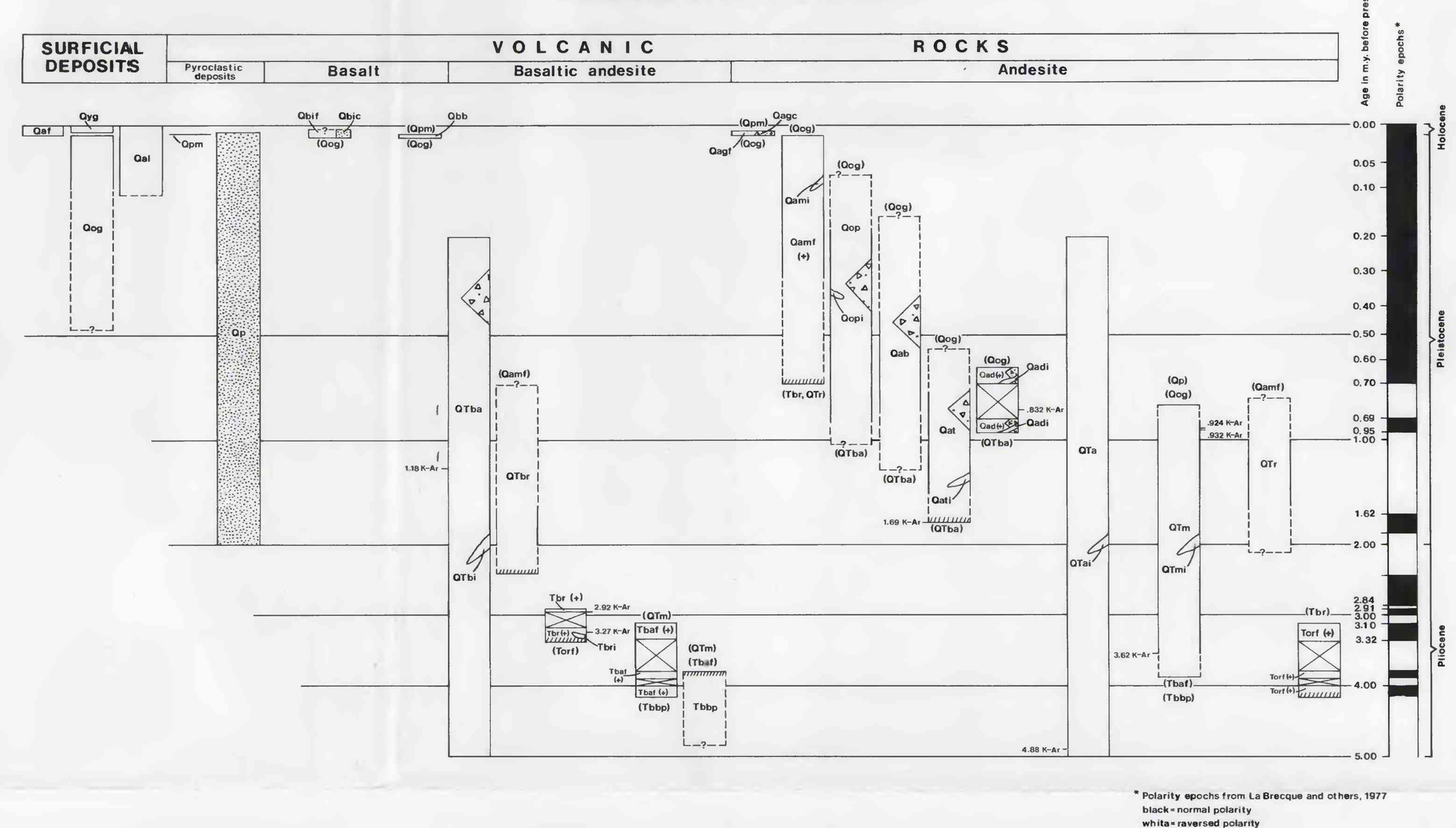
Geology from Smith (1983)

EXPLANATION

The areas of resource potential for construction materials, cinders, and volcanic breccia, are outlined on the map. Criteria for selection are shown below. Area B is considered to have lower potential than area A because deposits are older, more indurated, and contain a larger proportion of coarse clasts.

Area	Resource potential	Criteria used to define area
A	Low	(a) presence of red volcanic soil (b) presence of mapped cinder and ash, primarily in cinder cones (c) geomorphic form of cinder cones (d) location over central vent or on flanks of volcano or along a fault (e) deposits loosely consolidated
B	Low	(a) presence of red, black, or brown volcanic soil (b) presence of mapped cinder, ash, agglomerate, scoria, and bombs (c) shape of eroded cinder cones or vent fillings (d) location over central vent (e) deposits loosely to well consolidated

CORRELATION OF MAP UNITS



* Polarity epochs from La Brecque and others, 1977
black = normal polarity
white = reversed polarity

EXPLANATION FOR CORRELATION OF MAP UNITS

VERTICAL LINES

Solid—Age range relatively certain

Dashed—Possible age range

DIAGONAL LINES—Age range precluded by magnetic polarity measurements

HORIZONTAL LINES—Position indicates maximum or minimum age of unit

Solid—Age relatively certain

Dashed and queried—Age uncertain

Hachured—Maximum possible age based on K-Ar determinations, magnetic polarity, or stratigraphy

UNIT WITH MEASURED POLARITY

(+) Normal

(−) Reversed

3.27 K-Ar POTASSIUM-ARGON AGE DETERMINATION

(Qbr) UNIT IN WHICH STRATIGRAPHIC AGE IS LIMITED BY UNIT IN PARENTHESES

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

Qaf — ALLUVIAL FAN DEPOSIT (HOLOCENE)—Unconsolidated, poorly sorted, crudely bedded, locally derived silt, sand, gravel, and boulders. Deposits typically form where smaller streams enter larger streams, or, as along the eastern edge of the map area, where streams flow into lakes and alluvial basins

Qyg — YOUNGER GLACIAL DEPOSITS (HOLOCENE)—Includes generally small areas of talus, rock glaciers, and neo-glacial till

Qog — OLDER GLACIAL AND FLUVIOGLACIAL DEPOSITS (HOLOCENE AND PLEISTOCENE)—Moraines, chiefly end and lateral moraines, various types of drift, and fluvioglacial deposits

Qal — ALLUVIUM (HOLOCENE AND PLEISTOCENE)—Well- to poorly sorted, unconsolidated, locally derived detritus; mainly silt, sand, and gravel with local layers of conglomerate

VOLCANIC ROCKS

Pyroclastic deposits

Qpm — PUMICE AND ASH OF MOUNT MAZAMA (HOLOCENE)—Unconsolidated white, pink, buff, or gray dacitic and andesitic ash flow, ash, and pumice ejected from Mount Mazama during the climactic phase of eruption, approximately 6,700 to 6,850 years ago (Mehringer and others, 1977; Bacon, 1981)

Qp — PYROCLASTIC DEPOSITS OF BASALTIC AND ANDESITIC CINDER CONES (HOLOCENE AND PLEISTOCENE)—Mostly unconsolidated to poorly consolidated, well-stratified, red, brown, and black, fine- to coarse-grained basaltic to andesitic ejecta of ash, cinders, scoria, agglutinate, and bombs. Includes minor flows and associated feeder dikes

Basalt

BASALT OF IMAGINATION PEAK (HOLOCENE)—Composed of a few short flows of vesicular pahoehoe and a cinder cone centered on Imagination Peak. As mapped, unit is divided into:

Qbif — Flows—Fresh, black, vesicular basalt flows with small olivine phenocrysts and prominent white plagioclase phenocrysts

Qbic — Cinder cone—Patterned area represents a cinder cone of same composition as main flows (unit Qbif)

Qbb — BASALT OF BIG BUNCHGRASS (HOLOCENE)—Consists of a small shield which covers about 2 mi^2 (5 km^2). The shield is made of vesicular to scoriaceous porphyritic olivine-basalt flows, 3–10 ft (1–3 m) thick

Basaltic andesite

QTba — UNDIFFERENTIATED OLIVINE PHYRIC BASALTIC ANDESITE OF THE HIGH CASCADE RANGE (PLEISTOCENE AND PLIOCENE)—Thick to thin flows of blue-gray massive holocrystalline, generally vesicular olivine phyric basaltic andesite, volcanic breccia, dikes, vent plugs, and other small intrusive bodies. Unit, as mapped, locally includes:

QTbi — Intrusive rocks

QTbr — BASALTIC ANDESITE OF RYE FLAT (PLEISTOCENE AND PLIOCENE?)—Thick massive flows of blue-gray porphyritic olivine-bearing basaltic andesite. A low shield volcano and extensive flank flows make up unit. Lavas are similar to the olivine-bearing basaltic andesite of Blue Rock and to numerous shield volcanoes that are part of the undifferentiated olivine phyric basaltic andesite of the High Cascade Range

Tbr — OLIVINE-BEARING BASALTIC ANDESITE OF BLUE ROCK (PLIOCENE)—Flows, volcanic breccia cogenetic near-vent pyroclastic deposits, and, beyond mapped area, extensive valley-filling flows. Dominant lithology is light-blue-gray fine-grained olivine-bearing microdiktytaxitic basaltic andesite. Unit, as mapped, locally includes:

Tbri — Intrusive rocks and dikes—Darker and more aphanitic basaltic andesite that is generally similar to flows of major part of the Blue Rock unit

Tbaf — BASALTIC ANDESITE OF ASPEN AND LITTLE ASPEN BUTTES (PLIOCENE)—Mostly thin flows and volcanic breccia composed of dark-blue-gray to black aphanitic phenocryst-poor, commonly vesicular, glassy basaltic andesite and possibly andesite with rare and inconspicuous phenocrysts of olivine and plagioclase. Basaltic andesite of this unit formed a chain of steep-sided, generally well preserved shields, many topped by cinder cones

Tbbp — BASALTIC ANDESITE OF BUCK PEAK (PLIOCENE)—Porphyritic, olivine-bearing basaltic andesite characterized by distinctive small white plagioclase phenocrysts. A single small shield volcano surmounted by a small eroded cinder cone and a few flank flows constitutes unit

Andesite

PORPHYRITIC AUGITE ANDESITE OF GOOSE NEST (HOLOCENE)—Porphyritic olivine-bearing augite-andesite flows, tuff breccia of probable pyroclastic origin, mudflow tuff breccia, and a chain of cinder cones. Unit is divided into:

Qagf — Flows and tuff breccia

Qagc — Cinder cones—Patterned areas indicate a chain of cinder cones of same composition as flows of the major part of the Goose Nest unit

Qamf — Flows and interbedded pyroclastic deposits

Qami — Intrusive rocks of central conduits—Dark-blue-black augite andesite. Very similar to main cone lavas (unit Qamf), but nonvesicular

Qop — OLIVINE ANDESITE OF PELICAN BUTTE (PLEISTOCENE)—Porphyro-aphanitic, black and dark-blue-gray, generally finely vesicular phenocryst-poor andesite flows, interbedded volcanic breccia, and vent breccia, and a small intrusive conduit plugged by lava. Patterned area consists of tuff breccia and lapilli tuff near summit of mountain. Unit, as mapped, locally includes:

Qopi — Intrusive conduit plugged by lava associated with the central vent—Rocks from conduit are identical to flows of major part of the Pelican Butte unit

Qab — HYPERSTHENE ANDESITE OF BURMA LOOP ROAD AND KLAMATH POINT (PLEISTOCENE)—Dominantly blocky-weathering, porphyro-aphanitic, conspicuously porphyritic blue-gray hypersthene andesite flows, poorly exposed interbedded volcanic breccia, and vent breccia. Platy, inconspicuously porphyritic, olivine-bearing pilotaxitic andesite makes up a subordinate amount of unit. Patterned area is interpreted as a scoria- and breccia-filled vent, on the basis of cobbles and boulders of vesicular pyroxene andesite and ashy soil

Qat — PYROXENE ANDESITE OF TOM, JERRY, AND MUDJEKEEWIS MOUNTAINS (PLEISTOCENE)—Olivine-bearing basaltic andesite and generally dark-colored porphyro-aphanitic pyroxene andesite flows, interbedded volcanic breccia, vent breccia, and dikes. Several coalescing deeply dissected inconspicuous shield volcanoes constitute the unit. Patterned area consists of tuff breccia, lapilli tuff, and scoria of vent area. Unit, as mapped, locally includes:

Qati — Intrusive dikes and sills associated with vents—Numerous near-vent dikes and sills are dense black to dark gray, fine grained to aphanitic, and less porphyritic than flow rocks of the major part of the Tom, Jerry, and Mudjekeewis Mountains unit

Qad — PYROXENE ANDESITE AND BASALTIC ANDESITE OF DEVILS PEAK (PLEISTOCENE)—Alternating flows of platy, sparsely porphyritic pyroxene andesite and thin flows of olivine-bearing basaltic andesite, apparently erupted from same vents; layers of pyroclastic breccia, found mostly near vents; and vent breccia. Patterned area is underlain by tuff and tuff breccia filling vent. Unit, as mapped, locally includes:

Qadi — Intrusive plugs and dikes—Several crosscutting intrusive plugs that crop out south of Cliff Lake. They are remains of various feeders and near-surface magma chambers for Devils Peak volcano. Petrographically, intrusive rocks are similar to flow rocks of the major part of the Devils Peak unit

QTa — UNDIFFERENTIATED ANDESITE OF THE HIGH CASCADE RANGE (PLEISTOCENE AND PLIOCENE)—Lithologically heterogeneous, mostly porphyritic andesite with fine-grained to glassy groundmass in four small areas along west margin of mapped area and beyond. Unit, as mapped, locally includes:

QTai — Intrusive rocks, dikes, and vent plugs—Unit consists of central neck and associated intrusive bodies of Bessie Rock volcano

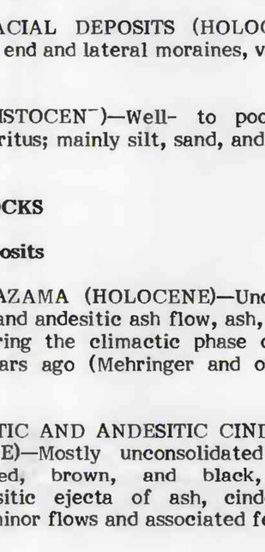
QTm — PYROXENE ANDESITE OF MOUNTAIN LAKES WILDERNESS (PLEISTOCENE AND PLIOCENE)—Dominantly pyroxene andesite flows that have a variety of textures and phenocryst proportions. The unit also includes near-vent pyroclastic deposits, domes, and shallow intrusive bodies. Patterned areas show probable vent breccias. Unit, as mapped, locally includes:

QTmi — Small intrusive plugs and dikes—Intrusive rocks similar to flows, particularly the more silicic ones, of major part of the Mountain Lakes Wilderness unit

QTr — OLIVINE ANDESITE AND PYROXENE ANDESITE OF RYE SPUR (PLEISTOCENE AND PLIOCENE?)—Interbedded dark-blue-gray vesicular fine-grained olivine and olivine-bearing basaltic andesite and blue-gray porphyro-aphanitic pyroxene andesite

OLIVINE ANDESITE AND PYROXENE ANDESITE OF MOUNT McLOUGHLIN (PLEISTOCENE)—Flows, interbedded pyroclastic breccia, lapilli breccia and tuff, and two small central conduits filled with congealed lava. Following rock types are present: blocky glass-rich black microvesicular olivine-bearing andesite; light-gray to purplish-gray, vesicular to frothy phenocryst-rich augite andesite; and dense olivine-bearing augite andesite. Unit, as mapped, locally divided into:

Torf — OLIVINE ANDESITE OF RUSTLER PEAK (PLIOCENE)—Fine-grained and porphyro-aphanitic, blue-gray, somewhat glassy olivine-bearing two-pyroxene andesite flows and interbedded volcanic diamictons



CONTACT—Dashed where approximately located; dotted where concealed; queried where inferred

FAULT—Dashed where approximately located; dotted where inferred; queried where uncertain. Ball and bar on downthrown side.

STRIKE AND DIP OF BEDS

CREST OF INDIVIDUAL MORAINE

APPROXIMATE BOUNDARY OF ROADLESS AREA AND WILDERNESS

EDGE OF AREA MAPPED FOR THIS REPORT

APPROXIMATE LOCATION OF MAJOR VOLCANIC VENT

VENT OF CINDER CONE

PYROCLASTIC TUFF BRECCIA, SCORIA, CINDER, AND ASH ASSOCIATED WITH VOLCANIC VENTS

PYROCLASTIC SCORIA, CINDER, AND ASH OF CINDER CONES

STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral resource potential survey of the Sky Lakes Roadless Area (A6143) and Mountain Lakes Wilderness in the Rogue River and Winema National Forests, Jackson and Klamath Counties, Oregon. Sky Lakes Roadless Area was classified as a recommended wilderness during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979. The Mountain Lakes Wilderness was established by Public Law 88-577, September 3, 1964.

SUMMARY

The only deposits of interest are volcanic cinders, scoria, ash, and breccia. Development of these resources is unlikely because they are remote and larger sources are more accessible. The potential for geothermal energy is low because favorable rocks and geologic structures are absent. The study areas are unfavorable for metallic deposits or for coal, oil, or gas resources because favorable rocks and structures are absent.

GEOLOGY

Sky Lakes Roadless Area and Mountain Lakes Wilderness are underlain by late Miocene to Holocene volcanic rocks. All of the bedrock units are part of the volcanic rocks of the High Cascade Range. Extensive glacial deposits mantle large parts of both study areas.

The volcanic rocks in the study areas comprise andesite stratovolcanoes, interspersed with broad shield volcanoes, small monogenetic volcanoes, extensive valley-filling flows, and cinder cones. Constructional volcanic landforms predominate.

The oldest dated rock unit within the two study areas is the pyroxene andesite of Mountain Lakes Wilderness. Most of the volcanoes, however, formed between 3.5 and 0.5 m.y years ago. Volcanic units younger than 500,000 years include the stratovolcano of Mount McLoughlin, two small basaltic shield volcanoes, a chain of pyroxene-andesite vents, numerous cinder cones, and ash deposits from the climactic eruption of Mount Mazama. The volcanic rocks, which show neither compositional nor spatial trends with time, form part of a typical calc-alkaline suite. The silica content of rocks within the study area ranges from 48 to 63 weight percent. Because of this low silica content the rocks are unlikely to be favorable sources for geothermal energy.

High-angle normal faults, such as those found along the west edge of the Klamath graben in the vicinity of Klamath Falls, may serve as pathways for deeply circulating groundwater and are potential sources of geothermal energy in that area. The west edge of the Klamath Graben lies about 5 mi (8 km) to the east of the study area. The distance to major fault systems, the lack of hot or warm springs in the two study areas, and the low silica content of the rocks make the likelihood of accessible geothermal resources very low.

GEOCHEMISTRY

Samples of all major rock types exposed in the study area were collected during geologic mapping. In addition rocks and stream pebbles were examined and those suggestive of alteration were collected. Stream samples were collected from most of the drainages and many of the bogs in the areas. Samples were processed and spectrographically analyzed. Results indicate no areas of clustered samples that contain unusually high concentrations of metallic elements. These results suggest that the study areas have a very low mineral resource potential for metallic-mineral deposits.

MINERAL RESOURCE ASSESSMENT

Sky Lakes Roadless Area and Mountain Lakes Wilderness have little mineral resource potential. There are no mining districts, mines, or recorded claims within the study areas, nor is there any indication of mining activity past or present. Geologic mapping, aeromagnetic surveys, rock and stream-sediment sampling, scintillation surveys, and assays failed to show any evidence of mineralization or hydrothermally altered areas.

Volcanic cinders, scoria, ash, and breccia form the only deposits of possible interest. Development is unlikely because equal or better quality deposits are available at more accessible localities.

The potential for geothermal energy is low; suitably young silicic volcanic rocks and geologic structures were not found during the present study.

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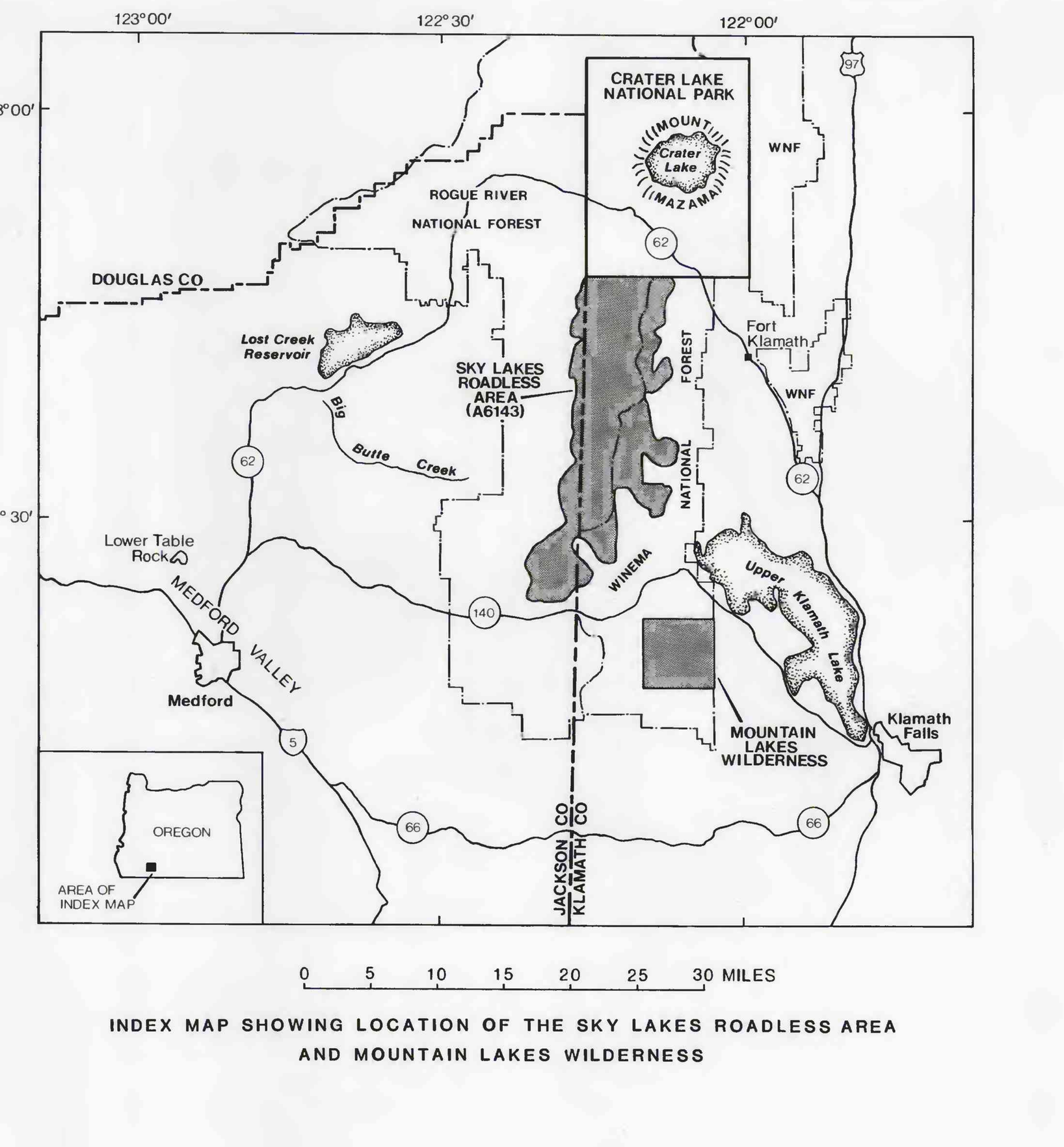

INDEX MAP SHOWING LOCATION OF THE SKY LAKES ROADLESS AREA AND MOUNTAIN LAKES WILDERNESS

MINERAL RESOURCE POTENTIAL MAP OF THE SKY LAKES ROADLESS AREA AND MOUNTAIN LAKES WILDERNESS, JACKSON AND KLAMATH COUNTIES, OREGON

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Explanatory pamphlet accompanies map

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